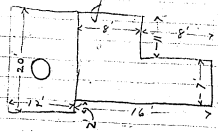
Edison Portland Cement Company Records
Plant Operations Notebook, N-02-01-23

This notebook covers the period January 1902-May 1903. It was used by Cloyd M. Chapman for work undertaken at Stewartsville on behalf of the Edison Ore Milling Syndicate, Ltd., and related interests. The notes pertain to briquetting experiments, furnace trials, kiln runs, and other tests using ores from Ogden, New Jersey ("Edison concentrate") and the Dunderland region of Norway. The front cover is labeled "Furnace Book." The book contains 193 numbered pages. Many pages are blank; one page was removed before the book was paginated.

Mineral wool experiment
Steam pipe line from boiler
to blast furnace — 1½" pipe
Covering for steam line
Trap " " " "
Superheater " " " "

Building —



Mineral Wool experiment
Two more burners for furnace
Holes cut for " in "
Furnace for superheater
1 2 [illegible] link to blast furnace
3" air line " " "

Fire brick made adjustable

1/23-02

Blast furnace trial #1

Started very slowly with natural draft for four hours then slight blast for two hours then put on about 5" blast (by water gauge) and 4 charges as follows:— (Same as slag to 200)

Feldspar	83½ lbs
Limestone	27½ "
Soda	2 lbs 11½ oz
Coke	17 lbs

When last charge was put in furnace it suddenly froze over stopping all draft. Had to let out bottom and clean out furnace. Bottom of furnace was at level of lower tap.

1/24/02

Blast furnace trial #2

Fired more quickly than yesterday getting up to full blast in about five hours. Used partly fused charge taken from furnace after last trial with addition of 2 lbs 11½ oz soda and considerable large proportion of coke.

Fell furnace very gradually and cautiously to subside against freezing.

Charge melted down but did not become liquid enough to run from tap hole — very little came out — remainder too thick and caked with coke to run. Used lower tap — not hot enough.

1-25-02

Blast furnace trial #3.

Fired as yesterday using same charge over again but building with bricks of furnace up to upper tap hole & added little more soda.

Charge melted down but was too thick to run from furnace. Not hot enough to be liquid.

1-29-02

Blast Furnace Trial No 4.

Started fire with wood at 9 A.M. heated slowly until 11 A.M. put on fine coke and heated at moderate blast until 1 P.M. then fired up rapidly until 2 P.M. which had a strong heat with good coke.

Kept tap hole open until charge which was same as used in run No 1 (fresh) was melting down at about 2:30 — then closed tap hole until some of charge was melted and tried to tap off — very little slag was obtained because it was not fluid enough to run.

Furnace bottom at upper tap hole.

Blast furnace trial #5.

Furnace bottom level with upper tap hole. Good Pa. coke.

Fired slowly to white heat - fed half broken window glass & half coke. Kept tap hole open. Glass ran from furnace throughout clogging tap hole but not fluid enough to catch in ladle and pour again. - Ate thro' lining of furnace - fire brick common - in two places - had to shut down. Before shutting down started to feed slag from B.F. trial #3 and it melted down but was not liquid enough to run from furnace. Soon after this began burnying had to stop on acct of holes in lining.

The glass after cooling was very brittle.

2-4-02

Blast furnace trial #6

Had lining of furnace removed and magnesia bricks - basic - put in to prevent silica getting into slag.

Fired up very slowly and fed half slag from trial to 4 and half good quality coke. Bottom of furnace level with upper tap hole. Got good heat before beginning to feed. Kept tap hole open. Slag melted but would not run from tap hole - opened tap hole up higher and let blast come thro' with the slag and it flowed fully as well as glass did in Trial #5.

The slag after cooling was very brittle.

12-5-02

Blast Furnace Trial #7

Heated furnace slowly and
until very hot — Kept tap
hole open — bottom 1½" below
tap hole.

Ground up charge to .02 g
and wet to stiff mud —
Fed 66# coke per 100 lbs charge
Charge nearly frozen over at
one time — choked off draught
Slag flowed from furnace
about as fluid as glass and
was very brittle when cold
Charge same as on Trial #1.

2-8-02

Blast Furnace Trial No 8

Furnace condition same as
last trial. Charge not
ground up — fed about 60#
Coke to 100# charge — was not
enough coke — charge could off
at tuyeres — had to stop run.
Up to time of cooling the slag
ran well — best results yet
obtained

1 2-9-02

Blast Furnace diac to 9

Hot Blast for Cupolo.

Height of furnace top from ground
10'-0"
Height of floor on top of furnace
3'-3"
Diam of stack inside 14"
Diam. fan outlet 12"
Center of furnace to outside of
building 5'-6"
Diam. dust ring on cupolo 3'-11"
Diam. pipe of " " " 6"
Height of " " " " Center 5'-2½"
Height of fan discharge when
vertical 3'-0"

Test of 4" screw conveyor with ground glass

wt of box 4#

10 turns delivered (slow)	9.5	lbs. net
20 " "	17.5	"
10 " "	8.5	"
20 " "	17	"
20 " " (faster)	17	"
20 " " (very fast)	17	"
20 " " " "	16.5	"
20 " " " "	17	"
20 " " quite slow	17	"
20 " " very slow	16.5	"
20 " " " "	17.	"

190) 161.0 (.8473

152 0

9 80

7 60

1400

1330

700

.8473# per rev.

(.8473) 1,000# per hour

16.6 " min

19.6 rpm to deliver 1,000 per hour.

Test of 4" screw Conveyor with Edison Conc.

Wt of box 4#

10 turns fairly fast	25.5#	net
20 " " "	51.5	
20 " fairly slow	54.	
20 " fast	54.5	
20 " fairly fast	52.	
20 " very slow	47.#	
20 " " "	52	
20 " " "	46.5#	
20 " fast	54.5	

170) 437.5

lbs delivered per rev. 2.57

20 000 lbs per hr.

3.33 " " min

130 rpm. to deliver 10 tons per hr.

2" Screw conveying powdered Coal delivered 20# 10oz per 50 rev. or 100# per hr. for every 41 rpm

Sprocket wheels to be had —
No. of teeth —

6	18	48
7	20	58
8	22	
11	30	
12	38	
14	45	

Do feed 5 turns per hour
Miser to run at 55 r.p.m
Iron feed to run at 65 r.p.m
Glass feed " " " 9.8 r.p.m

Countershaft to run at 100 r.p.m.
6 tooth sprocket on counter to 58 on glass feed
12 " " " " 18 " Iron "
22 " " " " 38 " Miser.

on motor 5" } r.p.m 900
on 1st Counter 34" } r.p.m 132
on " " 24" " 132 } to feed screw
on 1st " 12" } to 2nd Counter
on 2nd " 16" } " 100 " 1st Counter
on feed screw 6" " 530 } to 1st "

4/30/02 Kiln Run No. 71

Trial of rotary kiln as a stationary or continuous kiln.

Bricked over bottom of kiln to make level bottom 20" wide about. Moulded brick in place in furnace and heated with pea coal.

Ran two of each kind of brick – one set near front of furnace & other set near back. Found that back brick baked fully as well as those in front. First two brick which were hit by coal flame melted down a considerable.

The different forms of brick and mixtures tried were: –

#1 Brick 5"x5" at top 7"x7" at base 6" high containing 5% glass and ½% clay in Silicon Carb. It was not baked hard enough – very soft in center & on bottom.

#2 Brick same as last with hole down thru middle 2" diam at top

and 1½" at bottom – it baked better than brick #1 but was still soft on bottom

#3 Brick 6½" square & 2½" high of same mixture – baked soft on bottom

#4 Brick 3" sq at top & 5" sq at base & 6" high of same mixture as #1 – baked hard on top but soft on bottom.

#5 Brick of same size as #1 of Edison Cone, 5% glass and 1% clay – soft in centre & on bottom.

#6 Brick same size & hole as #2 of mixture same as #5 – baked hard on top – soft on bottom.

#7 Brick same size as #1 with E. Cone. 5% glass moistened with saturated solution of

Sodium Sulphate – crust baked ½" thick on outside & ~~soft~~ remainder soft

#8 Brick same size as #1 – E. Cone 5% glass moistened with Sat. Sol. American Oil & Supply Co's Soda Ash – baked a crust on outside – remainder very soft.

#9 Brick same – E. Cone, 5% glass moistened with Sat. Sol. Solvay Co's Carbonous Carb. Soda. Baked with crust & very soft inside.

#10 Same except moistened with Sat. Sol. Sulphate Iron – Crust outside soft inside

#11 Brick same – E. Cone 5% glass ½% clay moistened with Sat. Sol. Solvay Soda – crust outside soft inside

Each of these had two samples in kiln and at front end one brick divided into 4 sections thus: –

Dividing space ½" wide at top and ⅛" at bottom. This baked best of any in kiln but was in hottest part.

Next run to be made with special attention to getting circulation of hot gases thro' bricks.

5/2/02 Kiln Run No. 25

Furnace conditions same as last run – moulded two sets of 12 brick of the following description:–
Each moulded of Edison Concentrate with dust blown out of it – 5% of glass 4½% clay. Dried for 1½ hrs at nearly white heat.
#1 Brick 5" sq at top. 7" sq at base – 6" high – divided into 4 parts by opening ⅜" wide at top & ¼" at base – had two half round holes or arches thro base running length-wise of kiln – these holes were half of a 1" circle.

Baked fair well but not being heavy on bottom.

#2 Brick same size as No 1 with hole 1¾" diam. thro' in direction of length of kiln

Baked soft on bottom

#3 Same as #2 but hole turned at 45° with axis of kiln Baked very soft on bottom

#4 Same as No 2 & 3 but hole turned at right angles with axis of kiln Baked very soft on bottom

#5 Brick same size as No 1 but having a square fire brick 8" thick in its bottom and a hole down thro' its middle 2¼ in diam. Not hard on bottom

#6 Same as No 5 but fire brick in bottom is rounded and 1¼" high Not hard on bottom

#7 Same as No 5 but with a size C Battersea Crucible inverted in its middle. Not hard on bottom ~~hard on bottom~~

#8 Brick same size as #1 with hole thro' its middle 2½" diam at top & 2" at bottom Baked fairly well but not very hard on bottom

#9 Same as No 8 but hole 2" diam at top & 1½ at base Soft on bottom

#10. Same as #1. but holes at bottom turned at 45° with axis of kiln
Fairly hard on bottom

#11 Same as #1 but space between parts of brick only 1/2" at top 4 1/8" at base, not holes in base. Soft on middle & on bottom.

#12 Same as to 1 but holes in base turned at right angles with axis of kiln
Fairly hard on bottom

Each of these was duplicated and in front of the second set was a brick of Edison Conc. 5% clay divided into four parts.

Also one of same size but containing 5% glass & no clay

These clay & glass bricks seemed of nearly equal hardness

In front of all and to protect them from the direct flame from the coal gas were placed two brick of E. Conc. 5% glass & 1/2% Clay

Heat of this run was too high as most of the bricks melted down somewhat.

Next run to try value of clay & glass & clay & lime in bricks having openings thru them base.

Brick of form of #1 showed up best results.

Kiln Run No 3

General conditions same as previous run.
Bricks of following designs were baked.

#1 Brick 6" sq at top 7" at base 6" high divided into 4 parts with space ½" wide at top and 5/16" wide at base. Holes thro' have 1" wide and 1" high rounded at top. at 45° to axis of kiln
Edison Conc. with 5% of a mixture of 95% Clay + 5% slaked lime.
Soft – Perhaps not hot enough

#2 Brick same form as #1 with holes running in direction of axis of kiln
Edison Conc. with 5% of a mixture of 90% Red Clay and 10% slaked lime.
Soft perhaps not hot enough

#3 Same form of Brick as #1 with holes running at right angles to blast.
Edison Conc. with 5% of a mixture of 85% Red clay and 15% slaked lime.
Soft on bottom – harder on top – perhaps not hot enough

#4 Brick same size and same partitions as #1 but holes thro' bottom 2" high instead of 1". Holes set at 45° angles to blast.
Edison Conc. with 5% of a mixture of 80% Red clay and 20% slaked lime.
Fairly hard.

#5 Brick same form as #4 but holes set at 90° with axis of kiln. Edison Conc with 5% of a mixture of 75% Clay and 25% lime
good brick

#6 Brick same form as #4 but holes set parallel to axis of kiln. Edison Cone with 5% of a mixture of 70% Clay and 30% Lime. Fair

#7 Brick same size as #1 but holes thru bottom 1/2" wide and 2" high. Edison Cone with 5% of a mixture of 60% Clay and 40% Lime. Holes 45° to axis of kiln — Soft on bottom fairly hard on top.

#8 Brick same as #7 but holes set parallel with axis of kiln. Edison Cone alone. Fairly hard.

#9 Brick same as #7 but holes at right angles with axis of kiln. Edison Cone with 5% Red Clay. Dundeland " " " " " One half of brick Edison Cone & one half Dundeland Cone. Edison better than Dundeland. Neither good —

#10 Brick 5" across at top 7" across at base 6" high — ~~holes~~ divided into four sections 9/16" apart at base & 1/2" ~~wide~~ at top. Holes thru bottom 1/8" wide & 4" high. Edison Cone with 5% of Pottis Clay on one side & Dundeland Cone with 5% Pottis Clay on other half of brick — Holes at 45° with Axis of Kiln — Neither half very hard — ~~Edison~~ Dundeland well hard on top where it was packed hard and soft on bottom where it was evidently not packed tightly together.

#11. Brick same form as #10 but holes at 90° with axis of Kiln Edison Cone. 5% mixture of 25% glass and 75% Red clay. Not very good

#12 Brick same as #10 but holes parallel to axis of Kiln Edison Cone with 5% of a mixture of 50% glass & 50% Red clay Good – bottom soft – very hard on top.

#13. Brick of 16 sections each 3/8 sq at base & 2 3/4 at top 6" high and 1/4" apart at base & 1/4" apart at top. Edison Cone with 5% glass and 1/2% Red Clay. Hole thro bottom each section of brick 1/2" wide & 2" high. Good

#14 Brick 6" sq at top. 7" sq at base 6" high divided into 4 sections 1/4" apart at base and 1/4" at top Holes thro bottom 1/4 wide at bottom 1/4 at top & 2" high. Holes running at 45° to axis of Kiln Edison Cone. with 5% of a mixture of 75% clay and 25% glass Good

#15 Brick same size as #14 but holes set parallel with Axis of Kiln Edison Cone with 4% glass and 1% Red Clay very good

#16 Same as #14 but holes at 90° with axis of Kiln Edison Cone with 3% glass and 2% Red clay very good

#17 Brick 6" sq. at top 7" sq. at base
6" high sections 5/16" apart at
bottom and 1/2" at top. Holes
thru bottom same as #14
Holes running parallel to axis
of kiln. One half of brick of
Edison Cone with 3% glass + 1%
Red Clay - other half of Dundelkin
Cone - 13% glass 1% clay.
Soft on bottom - good on top
Edison better than Dundeland.

#18 Brick 5" sq. at top 7" at base
6" high partitions 5/16" thick at base
1/2" at top - holes 5/16" wide 3" high
Edison Cone. 4 1/2% clay (red) 1/2% slaked
lime. Holes at 45° with axis of kiln
Soft on bottom - fair on top

#19 Same as #18 but holes parallel
to axis of kiln. Edison Cone
with 4% clay (red) and 1% slaked lime
Fair

#20 Same as #18 but holes at
90° to axis of kiln. Edison
Cone with 3% Clay 1% slaked
lime.
Good - hard

#21 Brick same as #18 without
partitions and with round
hole thru middle 2 1/2" diam
at top and 1" at bottom.
Holes running parallel with
axis of kiln. Edison Cone. with
5% glass 1/2% clay (red).
Very good brick - very little of
soft portion in bottom.

#22 Brick same as #1 of both
ends. Holes parallel with axis
of kiln. Edison Cone with 5%
glass + 1/2% Red Clay.

#23 Brick 8 sq. at top
working partitions hole
parallel with axis of kiln
Edison Conc. 5% glass 1/2% red
clay

First run try Dundeland conc
in one section of each brick
with combinations of Clay, lime
Felspar, glass.

May. 12 - 02 Kiln Run #34

Furnace Conditions same as
previous run. Brick
of Edison Conc. with one
section of Dundeland Conc.
Edison Conc. mixed with glass
5% and red clay 1/2%.

Fired for 1 3/4 hrs. then let stand
#15 min. before opening front of kiln
- Dundeland conc. with
5% of mixture of 90% red clay + 10%
slaked lime.
Brick 6" sq. at top - 7" sq. at base
divided into 4 sections 5/16" apart
at base 1/2" at top each with
hole thru base 1 1/4" wide at
bottom 1/4" wide at top + 3" high
Brick elevated on two fire
bricks.
Holes at right angles with axis
of kiln.
Dundeland conc in rear
left section of brick

Very soft. Edison brick hard
not very hard on bottom.

#2 Brick same but holes parallel with axis.
Dundeland cone in rear left section of brick – with 5% of mixture of 95% red clay + 5% slaked lime.
Dundeland soft – Edison hard not very hard on bottom

#3 Brick same as #2.
Dundeland Cone in front right section – with mixture of 80% red clay + 20% slaked lime
Dundeland soft – Edison hard not very hard on bottom.

#4 Brick same as #1
Dundeland Cone in front right section with mixture of 85% red clay + 15% slaked lime.
Dundeland soft – Edison hard not very hard on bottom.

#5 Brick same as #1
Dundeland cone in rear right section with mixture of 75% red clay + 25% slaked lime.
Dundeland soft –
Edison not very hard on bottom

#6 Brick same as #2
Dundeland Cone in rear right section with mixture of 70% red clay + 30% slaked lime.
Dundeland soft
Edison not very hard on bottom

#7 Brick same as #2
Dundeland Cone in front left section – with mixture of 60% red clay + 40% slaked lime
Dundeland soft
Edison hard. fairly hard on bottom

#8 Brick same as #1
Dundulaud Cone in front left section - mix 5% of mixture of 80% red clay + 20% slaked lime.
Dundulaud soft.
Ellison Mark + hard on bottom.

#9 Brick same as #1
Dundulaud Cone in rear left section mix 5% of a mixture of 80% red clay 20% slaked lime + also 2½% of Main Felspar
Rather soft -

#10 Brick same as #2
Dundulaud Cone in rear left section mix 2½% Felspar + 5% of a mixture of 70% red Clay + 30% slaked lime.
Harder than #9

#11 Brick same as #2 but hollowed out underneath to make an arch)

5" high
Brick 4" high
Dundulaud Cone in rear right section mix 2½% of Main Felspar and 5% of a mixture of 60% red clay + 40% slaked lime
Brick hard - hard on bottom
Result no better than mix solid w/ brick under Iron brick.

#12 Brick same as #1 on brick like #11 - Dundulaud Cone in rear right section - mix 2% Main Felspar + 5% of a mixture of 80% red clay + 20% lime.
Brick hard - fairly hard on bottom.

#13 Brick same as #1 - on fire brick like #1 also, Dundulaud Cone in front left section mix 2% Main Felspar + 5% of mixture of 70% red clay + 30% slaked lime
Brick hard - soft on bottom

#14 Brick same as #2
Dundulaud Cone in front
left section with 5% of a
mixture of 90% white clay + 5%
Felspar.
Brick not as hard as #13
Rather soft on bottom.

#15 Brick same as #2
Dundulaud Cone in front right
section with 5% of mixture of
90% white Clay + 10% Felspar
Brick fell down in furnace

#16 Brick same as #1
Dundulaud Cone in front
right section with 5% of mixture
of 85% white Clay + 15% Felspar
Brick not very hard.

#17 Brick same as #1
Dundulaud cone in rear left
section - with 5% of mixture
of 80% white Clay + 20% Felspar
Brick not very hard - brittle.

#18 Brick same as #2
Dundulaud Cone in rear left
section with 5% of mixture of
70% white Clay + 30% Orthoclase
Felspar
Brick rather brittle

#19 Brick same as #2
Dundulaud Cone in rear right
section with 5% of mixture of 60%
white Clay + 40% Felspar
Brick fairly hard -

#20 Brick same as #1
Dunduland Cone in rear
right section with 5% of
mixture of 50% White Clay +
50% Feldspar
Brick hard - bottom fairly
hard.

#21 Brick same as #1
Dunduland Cone in front
left section with 5% of
mixture of 80% White Clay +
20% glass
Brick hard - fairly hard
on bottom

#22 Brick same as #2
Dunduland Cone in front
left section with 5% of
mixture of 60% white clay
and 40% glass.
Brick Hard - fairly hard on
bottom

#23 Brick same as #2
Dunduland Cone in front
right section - with 5% of
mixture of 40% white clay
and 60% glass
Brick hard - fairly hard on
bottom.

#24 Brick same as #1
Dunduland Cone in front
right section with 5% of
mixture of 20% white clay +
80% glass

Brick hard - fairly hard on bottom

Bricks of Edison Cone in
front.

Best results obtained with
the Dunduland Cone work
with mixtures of White Clay +
glass. - 80# clay to 20# glass per
Brick of ore worked well -

also mixtures of White clay and Felspar when more than 40 lbs of Felspar per test was used.

Also mixtures of red clay - slaked lime & felspar.

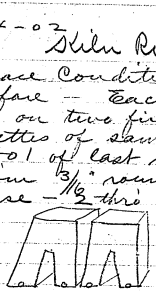
The Edison Conc. baked fairly hard on the bottom in all cases.

May 14 - 02

Skin Run No 5

Furnace Conditions same as before - Each brignette placed on two fire brick.

Brignettes of same form as Brick No 1 of last run but with four 3/16" round holes thro' base - 1/2 thro' base of each section



All holes parallel with axis of kiln.

Each brick has one section of Dunderland Ore & three sections of Edison Ore - Edison ore mixed with 5 % of glass & 1/2 % Red Clay.

First 5 bricks have the 3/16" holes Nos 6 to 10 have not the 3/16" " Nos 11 to 24 had brick 6" at top - 7" at base, 6" high - partitions 1/4 wide at base 1 1/4" at top - holes 1" wide at base 11/16 wide at top - 3 1/4" high. 3/16 holes thro base same as above brick

#1 – 80 Red Clay; 50 Felspar; 20 lime.
fairly hard.
#2. 80 Felspar; 20 glass. 12 Clay
Hard
#3. 80 Red Clay; 50 Felspar
hard
#4. 60 Felspar; 12 Red Clay
hard
#5. 80 Red Clay; 40 Felspar, 20 lime –
hard.
#6. 40 Red Clay; 15 Felspar; 25 glass.
hard.
#7. 80 Red Clay; 40 Felspar
fairly hard
#8. 40 Red Clay; 50 Felspar; 10 glass.
fairly hard
#9. 60 Red Clay; 40 Felspar
very hard
#10. 90 Red Clay; 10 glass.
very hard
#11. 50 Red Clay; 50 Felspar
#12. 85 Red Clay; 15 glass.
#13. 40 Red Clay; 60 Felspar.

#14 80 Red Clay; 20 glass
#15. 50 Red Clay; 40 Felspar
#16 90 White Clay; 10 glass
#17 40 Red Clay; 40 Felspar.
#18. 85 White Clay; 15 glass.
#19. 50 White Clay; 50 Felspar
#20. 80 White Clay; 20 glass.
#21 40 White Clay; 60 Felspar
#22. 40 White Clay; 50 Felspar; 25 glass
#23 40 White Clay; 50 Felspar; 10 glass
#24. 40 White Clay; 60 Felspar; 15 glass

Run made at night and heat was too low. Bricks all soft on bottom. Nyt

run to be of same mixture as this one but try ~~to~~ fire ~~p~~ brick floats instead of separating the fire bricks into pans under each briquette as in last Run.

Also try taller brick

May. 17-02 Kiln Run No 6

In this run the furnace conditions were still the same as in all previous runs. The mixtures used were the same as in the last run. The first two bricks Nos 1 & 2 were made 9" high instead of 6 but were otherwise of the same dimentions as Nos. 11 to 24 of last run. The first 6 bricks Nos 1 to 6 were set on an extra layer of fire brick closely set — not on separate squares of brick. Nos 7 to 24 were each set on separate squares of brick 3" apart — about Bricks Nos 20 to 24 were made of the same mold as bricks Nos 1 & 2 but cut off to 7½" high.

They were fired for 1¾ hrs at a high heat — fusing part of the front bricks

Bricks Nos 1 & 2 were very difficult to mould on account of their bright. No trouble in moulding any of the others.

The larger bricks - Nos 20 to 24 baked as well as the small ones.

The best mixtures were those containing 10 to 20 lbs. of glass with about equal parts of Clay and Felspar but those with about equal parts of Clay & Felspar were fairly good while those containing lime were quite soft.

May. 21, 02

Trials of single brick machine worked by hand to find what weight is necessary to compress Dundee=land Dry and what distance it must fall.

Brick moulded was 7½" high with a base 3⅜ square and a top 2⅜" sq. Each brick weighing about 4½ lbs.

Sole this bottom of brick 3" high 1¼ wide at bottom and 1¼" wide at top

Wt. plunger 1275+1150+1275+2420
Drop 10"
Sank 1st blow 3½
2nd " ¼
3rd " ¼
strong enough to stand

Wt same as above
Drop 10"
1st+2nd 3¾"
3rd " ¼" strong enough to stand

Wt same as above
Drop 8½"
1st drop sank 3 5/16"
2nd " " 3/16"
did not stand

Wt same as above
drop 6½"
1st drop sank 3½"
2nd " " 3/16"
3rd " " 0/16"
did not stand

Wt same as above
drop 3½"
3 drops
did not stand

Wt of plunger same as last
Drop 8½"
4 drops.
stood but fell easily

Wt plunger 1275+1150+1275+2420+2500
Drop 8½"
3 drops, strong enough to stand

Wt. plunger same as in above
Drop 8½"
1st drop sank 3 13/16"
2nd " " " 3/16"
3rd " " " 1/4"
strong enough to stand

Wt plunger - 7470 + 1160
Drop 10½"
to weak to stand

Wt plunger 7470+1160
Drop 10½"
3 drops
strong enough to stand

Wt of plunger 2420+7470+1160
Drop 10½" 2 drops.
pretty good

Wt plunger 11050
Drop 10½" 2 drops
very good.

June 12-02

Kiln Run No 7.

Furnace conditions same as in former runs.

Mould used ~~in~~ 7½" high 7" ~~sq~~ side at base with ¼" between sections - ½" taper on each side - Core 3" high 1¼ wide at base

Each brick set up on fire brick ~~on~~ or on a brick 2½" high 7½" sq, made of following mixtures of parts

No.	Cement	Fireclay	1/8" gravity	1/16" gravity	
1	1				cracked
2	4	1			soft
3	2	1			fair
4	1	1			"
5	1	2			good
6	1	4			cracked
7	4		1		soft
8	2		1		"
9	1		1		
10	4			1	"
11	2			1	fair
12	1			1	"

The bricks of Dundaland Co. were mixed with the following weight in lbs. per ton of binders.

No.	Red Hematite Mission Co.	Blue Clay	Felspar	White Clay	
1	20	80			soft
2	40	60			"
3	60	40			"
4	80	20			"
5		40	60		"
6		50	50		"
7		60	40		"
8			60	40	not very hard
9			50	50	soft
10			40	60	soft
11	20		80		soft
12	40		60		soft
13	60		40		very soft
14	80		20	"	"
15	20			80	soft
16	40			60	soft
17	60			40	soft
18	80			20	soft
19	70	30			soft
20	50	50	50		fair

No.	Red Hematite	Blue Clay	Felspar	~~[illegible]~~	
21	30	50	50		soft
22	40	40	40		rather soft
23	20	40	40		fair
24	10	50	50		fell down

Fired kiln for 1¾ hours - heat was too high as some bricks fused and sag too much.

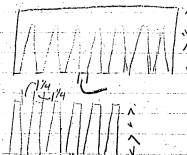
Run not satisfactory as some binders that have given good results before failed to work this time.

Next run try combinations of blue and white Clay with Felspar and some with a little glass. Try base bricks of combinations of cement + fire clay (1 to 1½ to 1 to 2½) and cement + fine pratty 1:1 to 1:4

July 9 1902

Kiln Run No. 8

Fired two large bricks of Edison Ore



Both to see if they would stand up and if they would bake on John Bottoms.

Both stood up - Edison Ore with clay - but neither baked on the bottom.

In front of these large brick were placed brick of the form described on Page 62 - each set on a concrete brick whose composition is given in the Brickes Machine book P. 6

One section of each brick was Sunderland Ore with the following binders - (lbs. per ton)

No	Felspar	white clay	Blue Clay	Marsh Ore	Gypsum	Concrete brick	
1	50	50				1	fair
2	50		50			2	fused
3	40	45			10	3	fused
4	45		45		10	6	fair
5	40		40	20		7	fused
6	50		50	50		8	"
7	40		40	20	15	11 or 12	fused
8	40		40	40	30	12 or 13	fused
9	60		40			13 or 14	fused
10	50		40		10	4 or 15	[illegible]
11	60	40				15 or 16	[illegible]
12	50	40			10	16 or 17	[illegible]

The conditions of kiln were same as previous run. The fire was kept high until kiln was hot then lowest coal fed need until end of run — time 3½ hrs then ¼ hr. before opening kiln.

Large brick having flat tops — see P. 65 — did not take as well as other large brick and neither baked as well as the smaller bricks.

Brick No.
1 hot very hard, soft on bottom
2 soft
3 fell down
4 soft on bottom fairly hard
5 hot very hard — soft on bottom
6 not very hard " " "
7 — fairly hard " " "
8 — " " " " "
9 — hard " " "
10 fairly " " " "
11 — fell down
12 — fairly hard " " "

Kiln Run No. 9.

Conditions of kiln unchanged. Placed in rear end four bricks of Edison & Dendurland Ore — one section Dendurland — of size & form described on page 62 — set on concrete brick described on P. 6 of Brick Machine book.

Below are given the lbs. per ton of binders used with the Dendurland Ore

No	Sulphur	White Clay	Black Clay	Waste Oil	Glass	Cement Brick	Result
1	50	50				16	soft
2	45	45			10	18	hard on top, soft on bottom
3	50		50			20	soft
4	45	—	45		10	19	Brick soft outside
7	60	40				21	hot very hard
8	60		40			22	
9	50		35		15	23	fell down because cement bricks pushed out from under them
10	—	60		60	20	24	
11	40	40		40		31	
12	40		40	20		32	

All cement bricks pushed out

Bricks No. 5 + 6 were 24" long
2 3/8" wide at top - 3 3/8" wide at base
coned. 3" high 4" wide at top + 1 1/4 at base
No. 5 were 1 1/2" apart + No 6 were
1/2" apart. No 5 baked
very much better than No 6
No 6 was very soft. Both
were made of Edison Conc.

July 28 - 02

Analyses of Binding Materials
used in previous Kiln Runs
for Phosphorous.

White Clay -	Phos.	.031 %
Blue clay	"	.091 %
Felspar	"	.082 %
Milledgeville Mill		.020
B		.014
C		.026
D		.030
E		.023
Florida Clay		.210
Rock - Bull Bay		.034
No 3 Main Felspar		.107
Compton Felspar		.002
Gibson China Clay		.015
Pomeroy Felspar		.012
Hewson Felspar		.030
Pure Main Felspar		.145

Continuous Kiln
Cover blocks were made of the following proportions of materials

No.	cement	sand		
1	1	2	5	Coarse clinker 2"
2	"	"	"	
3	1	2	4½	" "
4	"			
5	"			
6	"			
7	1	2	4½	Clinker 1½"
8	"			
9	"			
10	"			
11	1	2	5	Fire brick 2" not joined for space
12	"			
13	"			
14	"			
15	1	2	6	Fire-brick 2"
16	"			"
17	"			"
18	"			"
19	"			"

No.	cement	sand		
20	1	3	5	Fire Brick
21	"	"	"	
22	"	"	"	
23	"	"	"	
24	"	"	"	
25	"	"	"	
26	"	"	"	
27	1	3	6	Fire Brick
28	"	"	"	
29	"	"	"	
30	"	"	"	
31	"	"	"	
32	1	3	4	Fire Brick
33	"	"	"	
34	"	"	"	
35	"	"	"	
36	1	3	4	Clinker
37	"	"	"	
38	"	"	"	
39	"	"	"	
40	1	3	5	Fire brick 1 [illegible]
41	"	"	"	"
42	"	"	"	"
43	"	"	"	"
44	1	2	4	"

No	cement	sand	
45	1	2	4 Crushed Fire Brick
46	1	2	4 " " " "
47	1	2	4 " " " "
48	1	2	4 Brick 1 fire Clay
49	1	2	4 " " 1 " "
50	1	2	4 " " 1 "
51	1	2	4 " " 1 "
52			
53			
54			
55			

Results — Nos. 11, 16, 23, 28, 32, 12, 17, 23, 27, 21, 13 were in hot zone of kiln and all melted on under side — some enough to expose bottle

Kiln Run No 10

No	fire brick	fire clay	Portland cement	sand	Crushed fire brick No	Dron briquette
1	40	40		10	73	
2	40		40	10	Not good	good
3	50	40		15	75	
4	50		40	15	76	
5	60	40		15	fair 77	good
6	60		40	15	fair 78	good
7	60	40		10	79	fell down
8	60		40	10	80	good
9	60	40		20	81	good
10	60		40	20	82	good

Large bricks — 24" long set on 2" x 9" edge of fire brick set 2" into cement

11	Sample 7	83	good
12	" " 1	84	hard, cracked
13	" " 2	85	brittle
14	" " 3	86	very hard

Large brick did not get hard on bottom — all Edison Ore — good except 3/4" on bottom

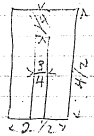
Kiln burned for 150 minutes.

Large brick was set on standard fire brick set on 1 part Atlas Portland Cement 2 1/2 parts crushed fire brick

with fine dust screened out with 200 mesh screen – all under 4 mesh. This did not have enough gum to make a solid concrete – it was porous

Kiln Run No. 11

Made base for large brick matrices for standard fire brick of following shape



Set in level in concrete made of 1 part Atlas Portland Cement to 1 1/2 parts sand. Burned [illegible] Corn, wet gas and clay for binders

No.	pulp per	pulp & clay	pulp & white clay	pulp & blue clay	pulp & sand		
1		10				33	soft
2			40			34	soft
3		40				35	"
4			40	10		36	soft
5		40		10		37	~~soft~~ fairly hard
6			40	10		38	~~soft~~ soft
7		40				39	~~soft~~
8			40			40	very soft
9		40				41	soft on bottom
10	50		50			42	fell down
	Large brick very large						
11		40			10	43	Hard
12			40		10	44	brittle
13		40			15	45	fell down
14			40	15		46	" "

large brick much better than large brick of Run #10 – hard almost to bottom.

Base for large briquettes 24 in. long by 18 in. broad, made brick ground floor.

Set in 1 part cement 4 parts crushed fire brick backed up with 1 part cement & 3 parts sand.

These large bricks of Edison Conc. baked thus to the bases very well in gas fired furnace for 2 hours.

The two mixtures in which the fire brick were set, baked and crumbled.

Briquettes of three sections of Edison Ore mixed with glass & clay and one section of Dundee Gold Ore mixed with the binders given on following page – placed on bricks of cement mixtures with fine clay or White clay or Blue clay or some sifted dry over their tops to keep the briquettes from sticking to the cement bricks

No.	Fireclay Kaolin	White Clay	Blue Clay	Glass	Bricks No.	Packing	Results on Briquettes
1	60	50		15	33	Fair Clay (F)	
2	60		50	15	34	Blue Clay (B)	
3	70	60			35	White Clay (W)	
4	70		60		36	Lemon (L)	
5	60	60			37	F	
6	60		60		38	B	
7	70	70			39	F	scaled
8	70		70		40	W	soft
9	80	65			41	L	scaled
10	80				42	F	soft on bottom
Large briquettes of Edison Conc.							good
11	50				47	B	crumbled
12	50				49	W	soft
13	60				50	L	crumbled
14	60				51	F	fair
15	80				Fire Brick	B	scaled
16	80				Cast Iron	W	fair
17	60				Fire Brick	F	scaled
18	60				"	L	good

Cement Bricks Nos. 33 to 42 incl. had been used in Run No. 11 and were in good condition at the beginning of this Run. Nos. 33, 34, 35, 37, 38, 40, 41 were in good condition at the end of this run after having been used twice. Bricks

Nos. 47, 49, 50 which were new at the beginning ~~end~~ of Run #12 were in good condition at its close and will be used in Run No. 13. All other bricks were spoiled by the Run.

The cast iron plate used under one briquette was melted down.

9-16-

Kiln Run No. 13.

In this run the furnace conditions remained unchanged – the briquette were of the form described in Run No. 7 Page 62. Three sections being of Edison Cone, ~~and one~~ mixed with glass 5% and clay ½% and one section of Dendulead Oil mixed with clay and Felspar as shown in the following table.

The felspar were obtained from the Golding & Sons Co. of Trenton and the clays from Valentine's of Woodbridge, N.J.

The cement blocks under the briquettes were covered as in the previous runs with either blue or white clay or fire clay or charcoal dust to keep the briquetts from adhering. The kiln was fired for ~~10~~ twelve and five minutes – and opened 15 min. after stopping the firing.

Briquette No.	Carbon Steel	Carbon Steel	Carbon Steel	A clay	B	C	D	Briquette Number	Operator Firing	Results of briquette	Resulting cement block	
1.	50			50				33	J	Good	fused	Briquette stuck to Cement Block
2	50				50			34	B	Good	fair	
3	50					50		35	L	good	good	
4		50	50					37	W	fair	good	
5		50			50			38	J	good	fused	
6		50				50		40	B	good	fused	
7	60		40					41	L	good	fused	
8	60				40			47	J	good	fused	
9	60					40		49	B	good	fused	
10		60	40					50	W	good	fused	
11		60			40			51	L	good	fused	
12		60				40		52	J	good	fused	
13	40		60					53	B	good	fused	
14	40				60			54	W	Well	fused	
15	40					60		55	L	Rather pretty	fused	
16		40	60					56	J	good	fair	
17		40			60			57	B	good	fused	
18		40				60		58	W	pretty good	fused	
19	50						50	59	L	fell	fused	
20		50					50	60	J	good	fused	
21	60						40	61	B	good	fused	
22		60					40	87	W	good	fused	
23	40						60	88	L	good	fused	
24		40					60	89	J	good	fused	

Fire clay on which the briquetts were placed during the firing instead of white clay

A Groundal process briquette received from Jas. Ballantine was weighed dry, then soaked in water over night, the surplus water wiped off and the briquette again weighed.

Weight dry 773 gms
" wet 822 "

Water absorbed 49 "
or 6.35 % of the weight of the dry briquette.

Cement Tops of Cars.

Car No.	Mixture
1 10-1-02	1 part cement, 2 parts fire clay 3 parts furnace clinker crushed to about 3/4" mesh but not screened.
2 10-2-02	1 cement, 2 fire clay, 3 clinker under 1/4" mesh.
3 10-3-03	

See Bucket Machine Book.

Oct. 24 – 02

Rotary Kiln Run for a method of firing that will heat the back end of kiln hottest.

Firing with 120–100 lbs of air and highest rate of coal feed got hottest point about 3/5 – or 12 to 15 ft from the front of the kiln. Heated this portion of the kiln very hot in very short time.

Firing with as little air as possible – just enough to burn the coal without smoke – and highest rate of coal feed got kiln hot all the way to back end – no hot spot near middle – very even heat from five feet from front of kiln to rear end and very little smoke.

Firing kiln with highest rate of coal feed and 12 lbs of air

Nov. 17 – 02

2nd Run of Tunnel Kiln

Fired with slow coal dust feed at 9:45 A.M. – heated to red by 5:00 P.M. – gradually increased heat until following morning.

Moulded briquettes on cement basis and placed on cars – used Edison Ore mixed with clay & Glass in three sections of Mould & Dumbelang Hessalite in fourth section mixed with the weights per ton given on the following page of binder.

The cars were moved thru kiln at intervals of 10 min.

Pushing of the cars to the side of the kiln stopped run before last briquettes had reached middle of kiln.

No.	Maine Fel.	Canada Fel	Blue clay	White clay			glass	Briqt No.	Result as to base	Result as to Briquette
1	60		40					105	Good	Good
2		60	40					106	Good	Good
3	60		40				15	107	Good	Good
4	60		40				30	108	Fused	Good
5		60		40			15	109	Fused	Good
6		50		30			20	94	Fused	Good
7		60		20			20	96	Fused	Good
8		50			30		20	111	Good	Good
9	50				30		20	120	Good	Good
10	60			20			20	110	Good	Good
11	50			30			20	113	Good	Good
12		50			20		30			
13		50			40		10			
14		60			20		20			
15		60			40	~~50~~				
16		60				40				
17		50				30	20			
								102	Good	
								103	Fused	
								100	Good	
								107	Good	

Furnace trial of Feb. 19, 1903

Run of Tunnel kiln.

Hot portion of furnace lined in sections of about five feet with one thickness fire brick leaving about 3/4" space between sections. These sections being laid after last run could not be bound to old wall securely and during heating up of kiln three fell in on top of the cars.

One car of bricks containing 16 groups of fours was run into kiln about 15 ft. when cars became fast and could not be moved. Then coal was fed at top speed to get heat to this car, Fired hard for about 1/2 hour then shut down fire and cooled furnace. Briquettes were well baked thro and seemed very satisfactory. In the following list, Nos. 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 32, 35 & 38 were on this car. The other briquettes in the list were baked in the Rotary kiln fired for 2 hours & 15 min. They were not all baked to the bottom.

Briquettes Nos. 1, 4, 10, 25, 32 & 35 were sent to ~~London~~ by Messrs Rhodes & Pollen. They were analyzed here with

see P-93

No.	Rockingham	Primary Sulphur		Ruby	Coley			
1	60			40				
2	70		Cannel Sulphur	30		Blue Clay	Stationary Kiln -	all right - near front of kiln
3		60			40		SK Fair	
4	-	70			30			
5	Sulphur No 6		60	Clay No. 9		40	S.K. all right	
6			70		Clay No. 8	30	SK hard enough	but cracked
7	60			40				
8	70	Sulphur No 7	Cannel Sulphur	30			S.K. Soft on	bottom, more too hard on top
9	60					40	Stationary Kiln-bo	k - fairly hard - probably acceptable
10	70				Clay No 3	30		
11		60		Clay D	Glass	40	S.K. All right	
12		70				30	S.K. Rather soft	all two.
13			50	40	10			
14	Sulphur No 1		60	20	20	Clay	SK. All right	
15								
16			60			40		
17			50	Clay No. 8	20	30	S.K. Soft on bottom	and inside legs - hard enough on top.
18	60			40			S.K Hard enough	but somewhat cracked. near front of kiln.
19	70		Sulphur No. 2	30	Clay No. 4	Clay No. 1		
20		75			25		SK ~~hard but~~ all right	~~cracked~~ & cracked
21	Sulphur No 4		55			35	SK hard but	cracked & cracked
22			60			30		
23	55				Clay No. 2	35	SK Scaled, cra	d & fell
24	60					30	SK Scaled cra	ked & fell apart.
25	55				35			
26	60				30		SK Fair, rathe	soft on bottom & between legs, hard enough on top.

No	Holder No. 5		Holder No. 6	Holder No. 10	Clay No. 22		Clay No. 3	Clay No. 5		
27	55				35				SK. soft on bottom	and between legs, 1st very hard on top.
28	60		Holder No. 6		30					
29			60	Holder No. 10	40		Clay No. 3		SK Rather soft on	bottom & between legs, hard on top.
30				60			40			
31				55	Clay No. 4		35		SK hard enough.	
32			60				30	Clay No. 5		
33	Holder No. 9		60		30				SK all right	
34			60					30	SK Cracked hard	enough.
35	80				10				SK all right	
36		70		Holder No. 2			20	Clay No. 10	SK. Scald and	cracked
37	Holder No. 3			60				30	SK. 1st very hard	
38	80						10			
39				70				20	SK hard enough	but scald off
40				60				30	SK all right	

the following results:—

No. 1 -	.033 %
No. 10 -	.034
No. 4 -	.040
No. 25 -	.033
No. 32 -	.034
No. 35 -	.028

The concentrate from which these briquettes were made analyzed .027%

It was afterward found that no dependence could be placed upon any of the above analyses.

Run of Tunnel Kiln May 1903

Kiln constructed in middle portion of red brick lined with 9" of fire brick with 1" air space between.

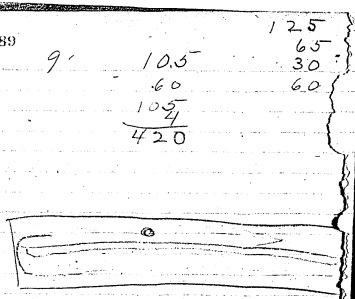
	Binder	Pressure			
1 —	Water	300 atmos	Hard outside		soft bottom
2 —	"	350 "	"	"	" "
3	100% to 15% Spanish Oil	4 drops	Hard shell		soft inside
4	Lime water	300 atmos	"	"	" bottom
5	2% lime" ash	"	"	"	" "
6	1% lime" "	"	"	"	" "
7	100% to 14 Spanish	300 "	"	"	" "
8	10% clay	5 drops	"	"	" inside
9	80% to 14 Spanish oil	300 atmos	"	"	" bottom
10	20% "	" "	"	"	" "

Nos 3 & 8 were molded in drop plunger machine — all others under hydraulic pressure — bricks 3" diam 1½" thick

9'

10.5
60
105
4
420

125
65
30
60



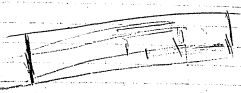
8 o'clock. 4" screw

20 rpm of Mixer gives 60# per min
1 rev. gives 3#
Running 10 tons or 20 000 lbs per hr
or 333.3 lbs per min mixer would
have to run 111 rpm.

100# = 1600 oz

33) 1600 | 48.48
132 | .50
280 | 2426.0
264
160

60) 2426 rev. delivers 100 lbs,
40 rev. per min

40 rpm
60

60) 2400
48
2
96